

REMARKS

Claims 1-3 and 5-19 and 23 are pending in the application. Claims 4, and 20-22 were previously canceled without prejudice or disclaimer. New Claim 23 is submitted for consideration. No new matter has been added. Reconsideration and allowance of the above referenced application is respectfully requested.

Claims 1, 3, 5-12 and 19 stand rejected under 35 U.S.C. § 103(a) over JP2000-311928 ("Yasushi") in view of Tanabe, et al. This rejection is traversed.

The Office recognizes that Yasushi fails to suggest nitriding a gate oxide layer with nitric oxide (NO) gas to form a nitrided gate oxide layer on the substrate. The Office relies on Tanabe, et al. to remedy this deficiency, asserting that Tanabe, et al. teaches "nitriding a gate oxide layer on a semiconductor substrate using nitric oxide gas to form the nitrided gate oxide layer on the substrate."¹ The Office also asserts that it would be obvious to combine the references "because NO oxidation produces a higher amount of nitrogen incorporation at the Si/SiO₂ interface than does N₂O oxidation (i.e. - a higher amount of nitrogen incorporation at the Si/SiO₂ interface reduces dopant migration)."²

The Office's reliance on Tanabe, et al. is misplaced. Tanabe, et al. does not support either proposition advanced by the Office. Tanabe, et al. does not teach "nitriding a gate oxide layer on a semiconductor substrate using nitric oxide gas to form the nitrided gate oxide layer", and Tanabe, et al. does not teach that "NO oxidation produces a higher amount of nitrogen incorporation at the Si/SiO₂ interface than does

¹ Office Action dated November 23, 2004, page 3.

² Office Action dated November 23, 2004, page 3.

N₂O oxidation”. Instead, Tanabe, et al. discloses only that an “oxidation and nitriding treatment ” may be carried out with either nitric oxide (NO) or nitrous oxide (N₂O).³ Since there is no teaching in Tanabe, et al. of the advantages of the use of nitric oxide over nitrous oxide, there would have been no motivation to combine Tanabe, et al. and Yasushi.

Even if one were motivated to combine the references, the cited references fail to provide any reasonable expectation of success. On the one hand, the claims require:

“nitriding a gate oxide layer on a semiconductor substrate using nitric oxide (NO) gas to form the nitrided gate oxide layer on the substrate; [and]
oxidizing the nitrided gate oxide layer on the substrate”

On the other hand, Tanabe, et al. teaches an “oxidizing and nitriding treatment” by “thermally treating the semiconductor substrate” in an NO or an N₂O atmosphere.⁴ The Office has not provided any explanation as to how or why Tanabe, et al.’s thermal “oxidizing and nitriding treatment” is the same as or somehow equivalent to the claimed nitriding to form a nitrided gate oxide layer and oxidizing the nitrided gate oxide layer. Indeed, Tanabe, et al.’s recitation of “oxidizing and nitriding” appears to be exactly the reverse of what is claimed. Tanabe, et al.’s recitation of “oxidizing and nitriding” is also exactly the reverse of what is disclosed in Yasushi. Applicants kindly submit that the combination of references advanced by the Office lacks any expectation of success, and the obviousness rejection should be withdrawn accordingly.

The Office’s separate rejection of dependent Claims 8 and 11 over Yasushi and Tanabe, et al. cannot stand, since these claims depend from independent claims which

³ Tanabe et al paragraph [0159].

⁴ Tanabe et al paragraph [0159].

themselves are not obvious over the same references, as discussed above. Contrary to what is advanced by the Office in the separate rejection, Applicants can find no teaching in Tanabe, et al. that the thickness is measured after a nitridation step. The rejection cannot be sustained on this ground.

Dependent Claims 2 and 14-18 stand rejected for obviousness over Yasushi in view of Tanabe, et al. and further in view of "Silicon Processing for the VLSI Era" Volumes 1-3 to Wolf, et al. This rejection is traversed. Given that Wolf, et al. does not remedy the deficiencies of Yasushi and Tanabe, et al. as to the broad claims, the addition of Wolf, et al. cannot make the dependent claims obvious. This rejection should be withdrawn as unsustainable.


CONCLUSION

In light of the above, Applicants believe that this application is in condition for allowance and therefore request favorable consideration.

If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

Respectfully submitted,

MERCHANT & GOULD P.C.


Steven B. Kelber
Registration No. 30,073

August 23, 2005

Date

P.O. Box 2903
Minneapolis, Minnesota 55402-0903
Telephone No. 202-326-0300
Facsimile No. 202- 326-0778

Dawn Gardner Krosnick
Registration No.: 44,118
Attorney of Record

23552

Patent & Trademark Office